Control unit **pCO³**

FLBB0MP20A, version 2.5

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User manual for control unit pCO³ Chiller:

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1. GENERAL

1.1 Scope of the manual

The scope of this manual is to supply all necessary information for the use of the pCO³ control.

The information found in this manual refers to the use of the control in the various types of unit in which it can be installed. It is therefore part of the documentation and integral with that stated in the "Instruction, use and maintenance manual" specific to the unit.

Considering the wide range of units that this control can manage, this manual surely contains more information than those regarding a specific unit.

1.2 Control functions

The electronic control with pCO³ microprocessor and FLBB0MMTTF program has been designed to manage chiller units, refrigerants and heat pumps.

The program envisions the possibility, by means of appropriate configuration, to mange water and air-cooled units with shell & tube and plate heat exchangers, with independent and parallel refrigerant circuits, essentially with hermetic compressors.

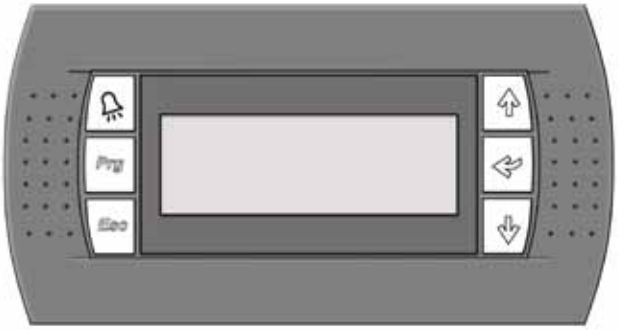
The management of a chiller unit means the control of functioning of the parts that make up the various envisioned functioning stages in complete safety.

2. USER INTERFACE

The user interface is made up from 6 keys and a display with 4 lines.

This interface can be used to start, stop and check unit functioning.

The information that appears on the display allows to know the functioning status of the unit and the six keys can be used to perform all operations necessary for use.



The functions of the six buttons are as follows:

Button: "up arrow" to scroll through the forms in the branches and to increase values in the various fields.

Button: "down arrow" to scroll through the forms in the branches and to decrease values in the various fields.

Button: "Button enter" to confirm a selection, access the various branches and change the parameters.

Button: "Button alarm" to stop a buzzer, to display and, if required, cancel active alarms.

Button: "Button prog" to access the loop of forms in the various branches.

This button returns you to the main display.

3. MENU MASKS

The groups of information that appear on the display are collected into masks.

The masks are then gathered into homogeneous groups.

Some can be accessed at any time using the keys, others, signals and alarms, only when the correct conditions are present.

The masks that can be accessed at any time are organised in a tree diagram, with a main menu and various sub-groups.

3.1 Main menu

The following branches are envisioned in the main menu: Service, Maintenance, GSM, Clock, Menu, Set, I/O and Historical.

For access to the various branches, after the "prg" button has been pressed, the control presents a mask containing a continuous loop, where all available menus are proposed on three lines.

The mask is made up from two lateral lines with normal depth and a double central one, which corresponds to the branch selected as in the following example.

```
M _ MAIN _ SCROLL
Change
Menu
Set
```

The complete loop is:

"Menu"; "Set Point"; "I/O"; "Clock"; "GSM"; "Maint."; "Service"; "On/Off"; and "Change".

The arrow keys are used within the branches to change the masks.

Except for the main menu, place the cursor in the field in thetop left on every mask.

To move around the fields, where it is possible to insert or change values, the "enter" key must be used.

The arrow keys can be used to vary the set value in a field selected using the "enter" key.

By pressing the "enter" key again the modified value is confirmed. Pass to the next field.

3.2 On/off mask

The unit can be started or stopped in this branch.

Access to the branch takes place from any mask by pressing the "prg" to access the main menu in order to select the branch.

After having scrolled the options of the mask upwards or downwards using the arrow keys until "On/off" appears in large dimensions on the central part of the display, confirm using the "enter" key.

```
Unit
Off
Press on [<-] for:
      - turn on -
```

-By pressing the "enter" key the unit is started if it is at a standstill or stopped if it is functioning

3.3 Maschere Menu

All general parameters that concern unit functioning are available in the "Menu" branch.

Access to the branch takes place from any mask by pressing the "Esc" key or by pressing the "prg" to access the main menu for the selection of the branch.

After having scrolled the options of the mask upwards or downwards using the arrow keys until "Menu" appears in large dimensions on the central part of the display, confirm using the "enter" key.

Except for the main mask "MENU_1" the others present are linked to the functions enabled.

.

MENU _ 1

```
Ref. Water     00.0°C
Set            00.0°C
System:Off
Chiller   Operation
```

In this mask it is possible to read the temperature of the reference water for functioning of the chiller unit, the set point set, the functioning status (it will be given even if the unit has been switched off from digital input or supervision) and the functioning mode.

This is the mask that appears on unit start-up and to which the program returns automatically.

MENU _ 2

```
Unload
Compressors
Operation
```

The mask will be present in the loop when the compressors are in operation.

MENU _ 3

```
Free Cooling
Off-line
Recovery
Off-line
```

The mask appears in the loop only when free cooling and recovery are in progress

MENU _ 4

```
Dual Set Point
Operating Mode
Operation
HIGH Set       00.0°C
```

The mask only appears if functioning is envisioned with double set point. The active set and its value can be read.

MENU _ 5

```
Delay Unload  00000s
Delay Load    00000s
Actual set    00.0°C
   |Dead Zone|
```

The mask only appears when the outlet temperature control function is enabled. The power decrease and increase delays can be read. These are expected by the control when the temperature of the reference water is out of the dead zone.

When the temperature of the reference water is out of the dead zone, an asterisk appears on the last line.

MENU _ 6

```
Unit Working          000%
Compressors Running    0
N. Unload              0
Stepless              000%
```

This form appears regardless of the unit's configuration, although the number of lines in the form depends on the type of compressors and capacity controls.

The first line indicates the percentage of capacity required by the system corresponding to the amount enabled on the unit; the second line indicates the number of enabled compressors; the third line indicates the number of capacity controls if there are compressors with capacity step control; and the fourth line indicates the percentage of capacity control if it is stepless.

3.4 Set Masks

The main functioning parameters can be set in the "Set" branch.

To enter the "SET" branch, after having scrolled the options of the mask upwards or downwards using the arrow keys until "SET" appears in large dimensions on the central part of the display, confirm using the "enter" key.

```
SET  1
Set Point
Summer          00.0°C
Winter          00.0°C
```

The summer set point can be set in this mask and, if functioning is envisioned, that in the heat pump.

```
SET  2
Dual Set Point Sel.
      HIGH
```

This mask only appears if functioning has been envisioned with double set point and the set point change over has been envisioned from the keyboard. It is therefore possible to change the functioning set point from "HIGH" to "LOW" and vice versa.

```
SET  3
Set Point
HIGH            00.0°C
LOW             00.0°C
```

Only if the operation has been anticipated with double set point, this mask it will appear, and it will be possible to vary the planned set point values.

```
SET  4
Set Point
Recovery         45.0°C
```

This form will only appear if heat recovery operation is possible, and the recovery set can be changed.

```
SET  6
Set Point       08.0°C
Outlet Alarm    04.0°C
Max. temp       15.0°C
```

This form will only appear if heat recovery operation is possible, and the recovery set can be changed.

```
SET  7
Set running:

SUMMER
```

This form only appears for chiller and heat pump units and allows you to change the operation from SUMMER to WINTER and vice versa, if the same function is not available from digital input

3.5 I/O Masks

In the "I/O" branch it is possible to see the status of all digital and analogue inputs and outputs.

To enter the "I/O" branch, after having scrolled the options of the mask upwards or downwards using the arrow keys until "I/O" appears in large dimensions on the central part of the display, confirm using the "enter" key.

```
I  0  01
Water temperature
Reference       00.0°C
Outlet 1        00.0°C
Outlet 2        00.0°C
```

```
I  0  2
Water Temperature
Outlet 3        00.0°C
Outlet 4        00.0°C
```

```
I  0  13
Recovery
Temperature     00.0°C
```

```
I  0  12
Water Temperature
Well 1          00.0°C
Well 2          00.0°C
```

```
I  0  12a
Water Temperature
Well 3          00.0°C
Well 4          00.0°C
```

```
I  0  11
External
Temperature     00.0°C
Inlet water
Temperature .   00.0°C
```

The values read by the relative probes will appear in this series of masks.

The masks really present depend on the features of the unit.

```
I  0  3
Compressor 1
H 00.0 L 00.0 O 00.0
B 00.0 B 00.0
D 00.0 D 00.0
```

The pressure values read by the relative probes will appear in this series of masks.

The masks really present depend on the features of the unit.

I _ 0 _ 07

```
Digital Inpout
Status 1-25
OOOOO OOOOO OOOOO
OOOOO OOOOO
```

I _ 0 _ 8

```
Digital Outpout
Status 1-18
AAAAA AAAAA
AAAAA AAA
```

I _ 0 _ 9

```
Digital Outpout
Status 19-36
AAAAA AAAAA
AAAAA AAA
```

The status of the digital inputs and outputs appear in these masks.

C = closed; A = open.

The masks really present depend on the features of the unit.

I _ 0 _ 10

```
Fan Speed Y2     000%
|
Fan Speed Y4     000%
|
```

This form indicates the percentage of the signal sent by the control to the 2 outputs that manage the speed regulators.

I _ 0 _ 14

```
Fre Cool Valve     000%
|
Recovery Valve     000%
|
```

This form indicates the percentage of the signal sent to the Free cooling valve and recovery valve, providing the functions are enabled.

I _ 0 _ 15

```
Absorbed
Current     000.0A
```

This form indicates the current absorbed by the unit when a current limit order is enabled.

I _ 0 _ 16

```
Coil Temperature
11 00.0°C  13 00.0°C
12 00.0°C  14 00.0°C
```

This form indicates the value detected by the probes on the condenser/evaporator coils of the heat pump units.

The form with relative fields is available for heat pump units when there are probes on the coils.

I _ 0 _ 16

```
Gas Discharge
Temperature
C1 00.0°C  C2 00.0°C
C3 00.0°C  C4 00.0°C
```

This form indicates the temperature of delivery gas of compressors in the screw units.

I _ 0 _ 18

```
Circuit 1 Valve 1
Steps 0000  SH  00.0°C
Evap  00.0b  00.0°C
T.asp 00.0°C
```

This form and the following ones indicate the number of steps at which the valve is working, the value of overheating, the suction pressure and its conversion in degrees, and the relative temperature.

The number of masks is equal to the number of electronic expansion valves installe

I _ 0 _ 22

```
Firmware vers.
Cirecuit 1
Driver 1  000   000
Driver 2  000   000
```

This set of forms indicates the software version for each driver.

I _ O _ 99

```
Unità Multi _ Compr.00
BLUE BOX
Cod. FLBB0MMTTF
Ver. 00.00  dd/mm/yy
```

The code, the version and state of issue of the program and the address in the unit pLAN when boss-runner functioning is envisioned, appear in this mask.

I _ O _ 100

```
Testing Date
  dd/mm/yyyy
Inspector Code
           00000
```

The date of inspection and the inspector's code are given in this mask.

3.6 Clock Masks

In the "Clock" branch it is possible to read the current time and, if necessary, set the exact time.

To enter the "Clock" branch, scroll the selections upwards or downwards using the arrow keys until "Clock" appears in large dimensions on the central part of the display, confirm using the "enter" key.

After having entered the branch, by pressing an "arrow" key, access the mask to set the password.

The clock branch password is 00001.

Orol _ 1

```
Date 00/00/00
     dd/mm/yy
Hour 00:00
     hh:mm
```

The current date and time appear in this mask.

Orol _ 2

```
Clock Password
       00000
```

The password must be set in this mask in order to enter the mask that allows to correct the date and time.

Orol _ 3

```
Date 00/00/00
     dd/mm/yy
Hour 00:00
     hh:mm
```

The correct date and time appear in this mask.

3.7 Maintenance Masks

The functioning hours and the number of start-ups of the various unit components can be displayed in this branch.

Access to the branch takes place from any mask by pressing the "prg" key to access the main menu to select the branch.

After having scrolled the options of the mask upwards or downwards using the arrow keys until "Maintenance" appears in large dimensions on the central part of the display, confirm using the "enter" key.

MENU _ 1

```
Operation Hours
Unit            00000
P1 0000      P2 00000
P3 0000     PFC 00000
```

MENU _ 2

```
Operation Hours
C1  0000    C2  00000
C3  0000    C4  00000
C5  0000    C6  00000
```

MENU _ 3

```
Operation Hours
C7  0000    C8  00000
C9  0000    C10 00000
C11 0000    C12 00000
```

MENU _ 4

```
Operation Hours
C13 0000    C14 00000
C15 0000    C16 00000
```

MENU _ 5

```
Starting
Unit            00000
P1 0000     P2 00000
P3 0000     PFC 00000
```

MENU _ 6

```
Starting
C1  0000    C2  00000
C3  0000    C4  00000
C5  0000    C6  00000
```

MENU _ 7

```
Starting
C7  0000    C8  00000
C9  0000    C10 00000
C11 0000    C12 00000
```

MENU _ 8

```
Starting
C13 0000    C14 00000
C15 0000    C16 00000
```

The masks really present depend on the features of the unit that the control manages.

4 UNIT FUNCTIONING

4.1 Unit in stand-by

The unit is in stand-by when it is correctly powered from the electric side and hydraulic side but is not enabled to function.

In this condition the control will display the values read by the analogue inputs and the status of the digital inputs and outputs.

To enable the unit from the stand-by condition:

– Close the digital input for the remote consent envisioned between clamps 1 and 2;
– Give the start command from the keyboard or via supervision serial port and/or Boss, if these control systems are envisioned;
– Start functioning from keyboard.

4.2 Enabling and stopping the unit

The unit is intended as enabled for functioning when the outputs can be activated automatically following plant requirements.

This condition exists when all functioning consents seen in the previous paragraph are present simultaneously.

The activation of functioning from the keyboard takes place in the "On/off" mask.

Once functioning has started, the control sees the plant requirements by reading the reference water probe in the case of stand-alone functioning and by the signal sent from the Boss if functioning in a network with other units.

The activation of the control outputs that command the various parts of the chiller unit, takes place automatically as programmed on the control, in order to guarantee good functioning of the unit.

4.3 Functioning in chiller and heat pump mode

All refrigerant units function as water chillers.

As well as cooling water for summer air conditioning, the heat pump units can also heat it for winter heating.

The temperature of the water for air conditioning and heating is set in the factory at the design values normally used, anyhow, it can be modified within limits.

The functioning change over from summer to winter can take place automatically by external consent or can be controlled from the keyboard.

The choice of the mode in which functioning change over is performed is made in the factory and it can only be modified by a technician.

The modification of the water temperature values and the functioning change over, when it is envisioned that this takes place from the keyboard, can be performed in the "Set" branch masks.

4.4 Functioning with double set

Some units for particular plants can supply cold water at two temperatures, normally, even if it is not the rule, one positive and one negative.

The two "set" functioning values are factory-set according to the requests of the design. However, they can be modified within envisioned limits.

The functioning set variation can take place automatically from external consent or can be controlled from the keyboard.

The choice of the mode in which functioning set change over is performed is made in the factory and it can only be modified by a technician.

The modification of the functioning set and the change over, when it is envisioned that this takes place from the keyboard, can be performed in the "Set" branch.

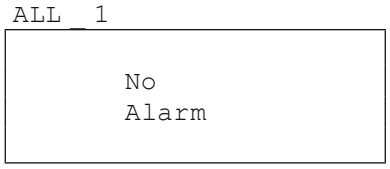
5 ALARM MASK

Any cause of bad functioning detected by the control enables an alarm mask.

The active alarm masks will only appear after the “alarm” key has been pressed.

The first time the “alarm” key is pressed any acoustic signal will be excluded, the second time it is pressed the active alarm mask will appear or if there is no alarm active the “ALL_1” mask will appear. All alarms present are cancelled the third time it is pressed.

If you remain inside an alarm mask for thirty minutes without pressing any key, the display will go back to the first mask of the menu branch.



This mask appears when the “alarm” key is pressed twice and no alarm is active.

All masks envisioned for signals and alarms in the software are stated below.

The scope of the list of masks is to be able to help the after-sales assistance, informing them of the type of alarm.

In all cases, if the alarm persists, an intervention must be requested from an after-sales centre.

Non-qualified persons must not intervene on the chiller unit

Example of alarm mask: